Remarks

Claims 1-28, 30-34, 45-49, and 52-58 are pending. Claims 29, 35-44, 50, 51 and 59-65 are cancelled. Claims 25-28, 30-34, 45-49, and 52-58 are withdrawn as directed to a non-elected invention or species.

Election/Restriction

Applicants have elected, with traverse, claims 1-24 as directed to the species *Thuja plicate* Don., the polar solvent methanol and the nonpolar solvent dichloromethane. Claims 1–17 and 19–24 read on the elected species. Cancellation of the non-elected claims will be reviewed upon notification of allowable subject matter.

Rejections Under 35 U.S.C. §103

Claims 1-5, 8-15, and 19-24 are rejected as obvious in light of Johannson et al. (2000; Wood Science and Technology 34: 389-401) in view of Diebold et al. (US 4,100,016), as evidenced by Johannson et al. (2000; Holzforschung 54: 246-254). Claims 1-24 are rejected as obvious over Johannson et al. (2000; Wood Science and Technology 34: 389-401) in view of Delong et al. (US 4,966,650), further in view of Naae et al. (US 6,207,808) and Diebold et al., as evidenced by Johannson et al. (2000; Holzforschung 54: 246-254).

The Examiner argues that the Wood Science and Technology paper teaches methanol extraction of tropolones from *Thuja plicata.* As previously noted, the Wood Science and Technology and Holzfoschung papers teach the **Soxhlet** method for extraction. The Soxhlet method is reputed to be the most efficient method of extraction since it involves the re-circularization and re-addition of solvent in a sequential series of extractions (i.e. several batches). This method, however, is not suitable for large-scale extractions such as those described in the invention. Notably, it is not **a** batch extraction process wherein **the** batch extraction mixture of solvent and plant materials is **maintained** under extraction conditions to extract tropolones into **the** batch of solvent. It is not obvious that the batch extraction method described in the invention could yield the large quantity of tropolones described in the invention.

Furthermore, the Examiner acknowledges that the Wood Science and Technology paper does not teach the claimed extraction period, extracting lignin from *Thuja plicata*, using the nonpolar solvent dichloromethane, or an additional wash using nonpolar solvent diethyl ether.

The Examiner argues that it is inherent that lignins and tropolones in *Thuja plicata* will be extracted by methanol and be soluble in the non-polar solvent based on the Holzforschung paper. According to the Examiner, the Holzforschung paper demonstrates that the color of the methanol-extractable heartwood is primarily due to a lignin-lignan co-polymer with lignan present as a minor component (referring to page 246, right column). With respect, the Examiner points to the conclusions of one study which are in disparity with the results of another. In fact, the major conclusion of the Holzforschung paper is exactly the opposite, i.e. that the color of the extractable heartwood *Thuja plicata* is due mostly to lignan (see abstract). Thus, the Holzforschung paper teaches that lignans, not lignin and tropolones, will be extracted by methanol. Further, it is not inherent from Holzforschung that methanol will extract at least 50 of the tropolones in the plant materials.

The Examiner argues that it would be obvious to use the batch extraction from Diebold et al. since it teaches separation and recovery of cellulose and lignin fractions in a highly effective manner. With respect, the Diebold et al. process is not comparable with the present method. Diebold et al. does teach a batch extraction from wood chips, but it is the extraction of cellulose (not cellulose and lignin as the Examiner argues). Furthermore, it is a harsh, *destructive* process resulting in the recovery of cellulose and dissolution of the remaining wood, including tropolones, which is later incinerated. The present process, on the contrary, is for the *recovery* of tropolones; it is a gentle, *non-destructive* method that allows for the recovery of tropolones in their bio-active form without physical damage to the wood.

A further important difference between the two processes is that in the current process, the extraction stops on its own when 10% of the wood mass is washed from the wood in the form of secondary metabolites, whereupon the solution containing these secondary metabolites is the first material to be removed from the vessel to be followed by the spent wood. On the contrary,

Diebold et al. teaches that the waste is the first material to be removed from the vessel, followed by the recovery of the cellulose fibrils.

In summary, Diebold does not teach a non-destructive method of extracting tropolones, the Holzforschung paper does not teach the extraction of lignin or tropolones, and the Wood Sciences and Technology paper does not teach a commercial scale, single batch method of extracting tropolones.

The surprising efficiency of the commercial scale batch extraction process of the invention is reflected in the claimed recovery of at least 50% of the tropolones in the plant materials into a batch of polar solvent, followed by partitioning of the tropolones substantially into a nonpolar solvent. It is respectfully submitted that there is nothing in the cited art that would provide a basis for a reasonable expectation that one could adjust batch extraction conditions and partition conditions to successfully achieve this surprising result

In addition to failing to provide a basis for any reasonable expectation of success in methods as claimed, the cited art does not suggest any motivation for optimizing a process to recover at least 50% of the tropolones from a plant material. The Holzforschung paper in particular explicitly teaches that lignans, rather than tropolones, are responsible for the coloration of cedar pulps. The cited art teaches that tropolones are substantially destroyed by the pulping process, effectively teaching that there is no reason to develop commercially-relevant techniques for optimal tropolone extraction.

The Examiner objects to the Applicant's conclusion that Example 1 teaches higher yields than the Soxhlet procedure. More specifically, the Examiner does not understand how the applicant reaches the number of 0.568% as the yield reported in Johansson *et al.* With respect, the Applicant's calculations are accurate. Example 1 teaches a yield of 6% extractives by weight of the original plant material, whereas Johansson *et al* teaches a yield of 14.2% extractives by weight of original plant material (142g extractives per 1000g of original material). Example 1 teaches that 14-17% of the extractives are tropolones, that is, 0.8-1.0% of the original material (e.g. $0.06 \times 0.14 = 0.008$ or 0.8%). Johansson *et al.* teaches, from Table 4 on p.398, that 4% of

the extractives are tropolones, that is, 0.568% of the original material (0.142 × 0.04 = 0.00568 or 0.568%). Therefore, Example 1 does in fact illustrate a significant, surprising and unpredicted improvement over the yields reported by Johansson *et al.*

The Examiner rejects the Applicant's argument that the Holzforschung paper teaches away from optimizing techniques to tropolone extraction. Respectfully, the Examiner has conflated the contribution of tropolones to the odor, colour, and durability of cedar wood with its contribution to the undesired coloration of cedar *pulp*. Specifically, the Examiner refers to a passage from Holzforschung indicating that red cedar extractives are responsible for the *wood's* characteristic odor, colour, and durability to refute the Applicant's argument that Holzforschung teaches lignans, and not tropolones, are responsible for the undesired coloration of cedar pulps. Respectfully, pulp and wood are not the same thing. Secondly, the Examiner neglects to mention that the extractives responsible for the odor, colour, and durability that are unique to red cedar (and thus the logical candidate to account for the observed differences with other softwoods) are *lignans*, not tropolones. The Holzforschung paper clearly teaches (see the abstract) that the majority of red cedar's heartwood color is derived from lignans, not tropolones. Therefore, Holzforschung teaches away from a need to develop techniques for optimal tropolone extraction because tropolones are not the cause of the undesirable pulp coloration. The Applicant agrees that KSR negates the need for a specific teaching, suggestion, or motivation to support a finding of obvious. However, the Applicant respectfully submits that KSR does not foreclose consideration of prior art that teaches away as evidence of non-obviousness.

In summary, Applicant respectfully submits that the cited references fail to satisfy the requirements for a finding of obviousness of the claims as amended, in accordance with the requirements of the "Examination Guidelines for Determining Obviousness Under 35 U.S.C. § 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*" (Federal Register, Vol. 72, No. 195, Oct. 10, 2007, pp. 57526 – 57535) (the "Guidelines").

Respectfully submitted,

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